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ABSTRACT

This report compares cancer mortality rates in rural Appalachian Kentucky with rates for rural non-Appalachian Kentucky and the U.S. white population. Rural Appalachian Kentucky differs from the rest of rural Kentucky in having a younger, poorer, less educated population with greater employment in mining as opposed to agriculture, and with less access to public water and sanitation. Overall average annual age-adjusted cancer mortality rates for 1981-85 did not differ substantially among rural Appalachian Kentucky, rural non-Appalachian Kentucky, and the United States. However, compared to national figures, both Kentucky sectors showed substantially greater increases in cancer mortality since 1971-75; the greatest increases were among non-Appalachian males and Appalachian females. Males had significantly higher cancer mortality than females in all comparison groups. Lung cancer was the leading cause of cancer death for both men and women in the Appalachian group, increasing nearly 50% for men and over 100% for women since 1971-75. Compared to national figures, colon cancer mortality rates were lower in Appalachian Kentucky and higher in non-Appalachian Kentucky. Rural Appalachian females had twice the cervical cancer mortality rate and a significantly lower breast cancer mortality rate than U.S. white females. This report contains 12 tables, 5 graphs, and 2 maps. (SV)

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Appalachian Data Bank Report #6

November 1988

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THE APPALACHIAN CENTER

UNIVERSITY OF KENTUCKY

CANCER MORTALITY IN RURAL APPALACHIAN KENTUCKY

Appalachian Data Bank Report #6

November 1988

by

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The following report was produced by the Appalachian Center
in cooperation with the Markey Cancer Center
at the University of Kentucky.

CANCER MORTALITY IN RURAL APPALACHIAN KENTUCKY

HIGHLIGHTS

* Cancer mortality rates are increasing at a more rapid pace among both the rural Appalachian and rural non-Appalachian Kentucky populations compared to the U.S. population.

* The lung cancer mortality rate among rural Appalachian Kentucky males is much higher than that of either rural non-Appalachian Kentucky or the U.S. male population.

* Lung cancer mortality has surpassed breast cancer mortality to become the leading cause of death from cancer among rural Appalachian women.

* Colon cancer mortality rates are lower for both males and females in rural Appalachian Kentucky compared to the U.S.

* Colon cancer mortality rates are much higher among the rural non-Appalachian Kentucky population compared to the U.S. population.

* Females in rural Appalachian Kentucky have a cervical cancer mortality rate which is nearly twice that of the U.S. female population.

* Breast cancer mortality rates among rural Appalachian Kentucky women are lower than either the rural non-Appalachian Kentucky females or the U.S. female population.

CANCER MORTALITY IN RURAL APPALACHIAN KENTUCKY

I. INTRODUCTION

In this report cancer mortality rates in rural Appalachian Kentucky are examined. Rates in rural Appalachian Kentucky are compared with both non-Appalachian Kentucky and the U.S.

Deaths from infectious diseases, infant mortality, accidents and suicides have been reported as unusually high among residents of Appalachian Kentucky. However, crude death rates from cancer have been reported as being much lower in Appalachia than in non-Appalachian areas of Kentucky.[1]

Cancer is second only to heart disease as a leading cause of death in the U.S. An estimated 483,000 people died from cancer in 1987.[2] Mortality from cancer has been associated with lifestyle, dietary patterns, poverty and access to medical care. Thus, it seems particularly appropriate to examine cancer mortality in Appalachian Kentucky in order to better understand its true significance.

In this report, Kentucky's counties have been divided into two separate groups for the purposes of comparison: 1) The Appalachian region of Kentucky as defined by the Appalachian Regional Commission (ARC) and 2) The non-Appalachian region of Kentucky. (The boundary separating these two areas is shown in map 1).

However, before a meaningful analysis of cancer mortality can be undertaken, it is necessary to understand that the age structure of a population will have a significant influence on cancer mortality rates. In other words, if a population has more older people it will have a correspondingly higher crude cancer death rate. Furthermore, rural areas in the U.S. have been shown to have lower age adjusted death rates from cancer than urban areas.[5,6] Thus, in order to effectively compare cancer mortality between Appalachian and non-Appalachian Kentucky, adjustments must be made for both differences in the age of the two populations and differences in the proportions of the population living in rural areas.

The average annual <u>crude</u> cancer death rate in Appalachian Kentucky (1981-1985) was 178 per 100,000 population as compared to 202 for non-Appalachian Kentucky. The average annual <u>age adjusted</u> cancer mortality rate for Appalachian Kentucky (1981-1985) was 169 per 100,000 population and 184 for non-Appalachian Kentucky. It is clear from these rates that even after adjusting for age the Appalachian area of Kentucky has a substantially lower cancer death rate.

MAP 1

Boundary Separating Appalachian and Non-Appalachian Areas of Kentucky
(ARC Definition)

However, the proportion of rural residents differs greatly between Appalachia and non-Appalachian Kentucky. In the Appalachian Kentucky population 78.6% live in rural areas while only 36.7% of the non-Appalachian Kentucky population live in rural areas. For this report, rural was defined as living outside a standard metropolitan statistical area and living outside incorporated towns of more than 2500 population. Only counties with 60% or more of the population living in rural areas were included in the calculation of cancer mortality rates for the rural Appalachian and non-Appalachian Kentucky comparisons. (Map 2 shows that only 6 of the 49 Appalachian Kentucky counties were non rural by this definition while 26 of the 71 non-Appalachian counties did not meet the definition of rural).

Because, Appalachia is primarily rural and rural areas have been shown to have lower cancer death rates, in this report only differences between cancer mortality in rural Appalachian Kentucky and rural non-Appalachian Kentucky were examined. The average annual age adjusted cancer death rate for rural Appalachian Kentucky (1981-1985) was 168 per 100,000 population as compared to 170 for rural non-Appalachian Kentucky.

Demographic data for the analysis were drawn from the U.S. 1980 census.[3] Crude cancer death rates and age adjusted cancer death rates for Kentucky were provided by the Kentucky Department of Health Services. U.S. cancer mortality rates were obtained from the National Center for Health Statistics.[4] Age adjustment was done by the direct method applying Kentucky age specific cancer death rates to the U.S. 1970 standard population. Age adjusted cancer death rates in the U.S. are also calculated using the 1970 standard population. The majority of people in rural Appalachia (99%) and rural non-Appalachia (96%) in Kentucky are white. Therefore, all U.S rates used for comparison in this report were calculated using whites only. Five year average annual cancer death rates were used in all comparisons to reduce the problem of interyear variations. Average annual cancer mortality rates for the time periods of 1971 through 1975, 1976 through 1980, and 1981 through 1985 were used to examine changes in cancer mortality over time. All data analysis was performed using the Paired Community Laboratory System (PCLS). The PCLS is a computer system developed at the University of Kentucky through a grant from the American Cancer Society and with support from the Appalachian Center.

II. FINDINGS

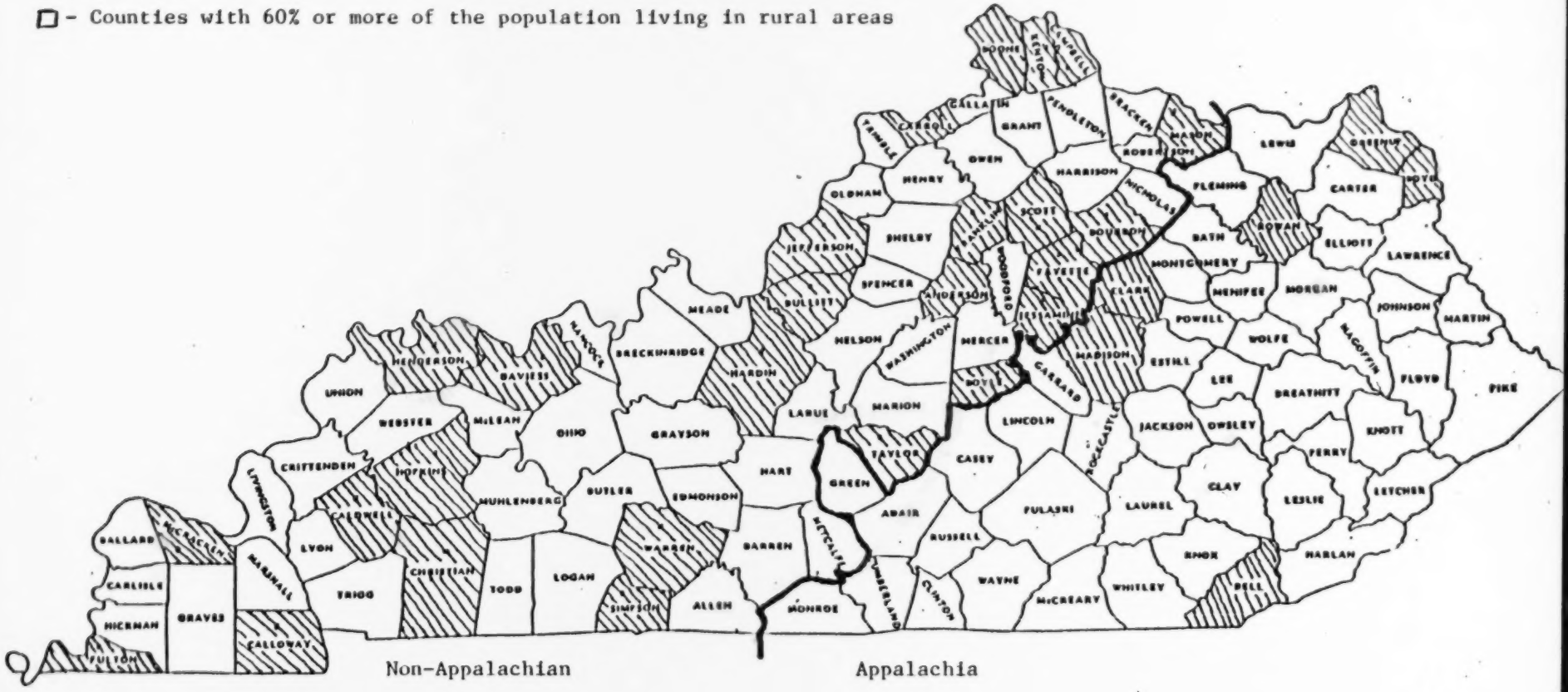
A number of important factors which may influence health in general and may contribute to different cancer mortality rates distinguish rural

MAP 2

Rural Appalachian and Non-Appalachian Counties in Kentucky

▨ - Counties with less than 60% of the population living in rural areas

□ - Counties with 60% or more of the population living in rural areas



Appalachia from rural non-Appalachian Kentucky. The rural Appalachian population of Kentucky is younger than the non-Appalachian population (1980 census). Eleven percent of the 847,397 people living in rural Appalachian Kentucky are over the age of 65, while 13% of the 660,857 non-Appalachian rural population are over age 65. Twenty-five percent of the rural Appalachian families in Kentucky are below the federal poverty level, while only 17% of the non-Appalachian rural families are classified as being below the federal poverty level. Sixteen percent of the work force of rural Appalachian Kentucky are employed in the mining industry, while only 4% of the rural non-Appalachian Kentucky work force are employed in mining. This difference is a major distinction in that rural non-Appalachian Kentucky is predominantly agriculture-based while a substantial proportion of the rural Appalachian population is employed in mining. There are also significant differences in educational achievement between rural Appalachia and non-Appalachia in Kentucky. Among rural residents over 25 years of age, 49% in Appalachian Kentucky have less than an 8th grade education, while 35% in non-Appalachian Kentucky have less than an 8th grade education.

In addition, access to various public services is different between the two areas. Only 42% of the households in rural Appalachian Kentucky use public water systems, while 62% of the households in non-Appalachian Kentucky have public water. Twenty-one percent of rural Appalachian households are connected to public sewers, while 34% of the rural non-Appalachian households are connected, and 21% of rural Appalachian Kentucky households do not have telephones while only 11% of non-Appalachian households are without telephones.

The differences in access to hospital beds between the two areas appears to be minimal. There were 2.7 hospital beds per 1000 population in rural Appalachian Kentucky as compared to 2.4 for rural non-Appalachia (1980 census). In contrast, there were 76.8 physicians per 100,000 population in rural Appalachian Kentucky as compared to 59.6 in rural non-Appalachian Kentucky. These differences appear to favor access to medical care for people in rural Appalachia and they may reflect the substantial efforts of the Appalachian Regional Commission to increase access to care. It should be noted, however, that funding for the Appalachian Regional Commission has been reduced to a small fraction of its earlier levels. Thus, there may be significant reductions in the availability of physicians which have occurred since 1980.

The characteristics which differentiate the rural Appalachian and non-Appalachian populations in Kentucky are shown in Table 1.

TABLE 1

Characteristics of Appalachian and Non-Appalachian Rural Kentucky
(1980 U.S. Census)

Characteristics	Rural Appalachia	Rural Non-Appalachia
Total Population	847,397	660,857
Male Population	417,750	325,932
Female Population	429,674	334,925
% Over Age 65	11	13
% Below Federal Poverty Level	28	17
% Employed in Mining	16	4
% Employed in Agriculture	6	11
% Less than 8th Grade Education	49	35
% Households on Public Water System	42	62
% Households on Public Sewer System	21	34
% Households Without Telephone	21	11
Hospital Beds per 1000 Population	2.7	2.4
Physicians per 100,000 Population	76.8	59.6

While these characteristics may or may not be associated with the health status of the population, they do clearly illustrate substantial differences between the rural Appalachian and non-Appalachian populations of Kentucky. The degree to which any combination of these characteristics may influence the cancer mortality rate is beyond the scope of this report. However, understanding some of the characteristics which distinguish rural Appalachia from other rural areas may be useful.

A. CANCER MORTALITY RATES

Overall average annual age adjusted cancer mortality rates among rural Appalachian Kentucky, non-Appalachian Kentucky and the U.S. are not substantially different (see Table 2). However, the overall cancer mortality rates have been increasing at a much faster rate in both rural Appalachian and non-Appalachian Kentucky as compared to the U.S (see Figure 1).

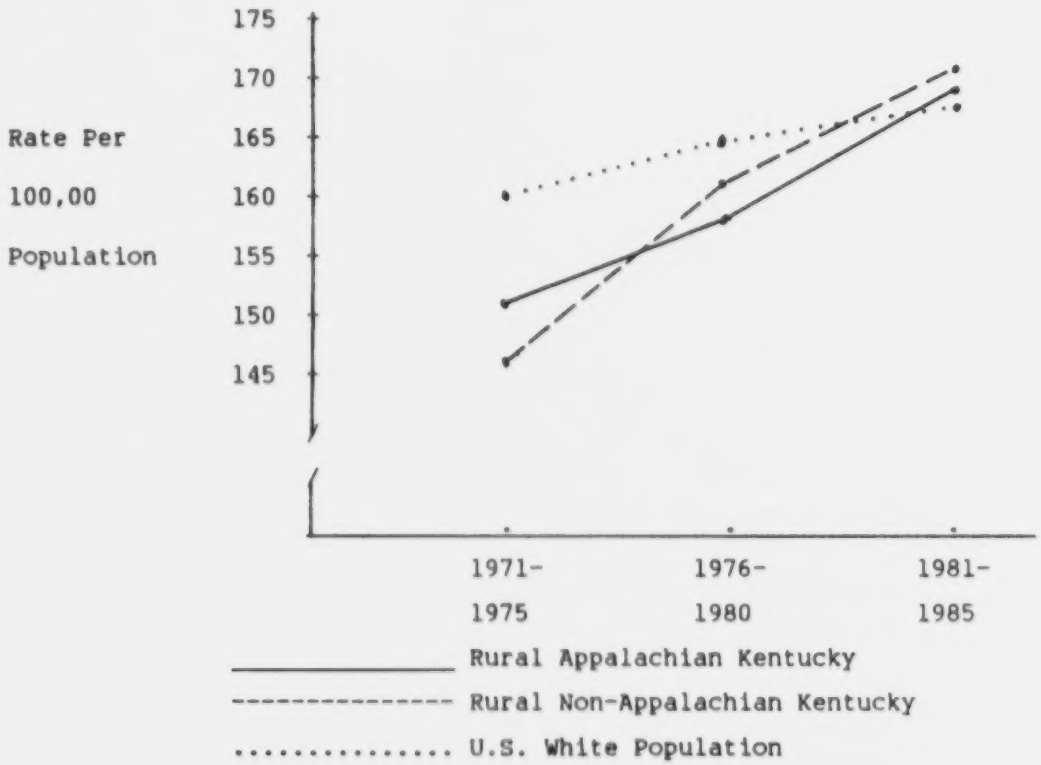
TABLE 2

Average Annual Age Adjusted Cancer Mortality Rates Per 100,000 Population

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky	151.2	157.5	168.2
Rural Non-Appalachian Kentucky	147.9	160.8	170.3
U.S. White Population	159.8	163.0	167.0

Figure 1

Increases in Average Annual Age Adjusted Cancer Mortality Rates



The five year average annual age adjusted cancer mortality rates for rural Appalachian Kentucky, rural non-Appalachian Kentucky and the U.S. are very similar in the 1981-85 time period. However, the rate of increase in overall cancer mortality in Kentucky is an area for further investigation. If these rates of cancer mortality continue to increase into the future, Kentucky will have unusually high cancer mortality rates as compared to the U.S.

There are significant differences in the rates of cancer mortality between males and females. Males have significantly higher average annual age

adjusted cancer death rates in each comparison group. Table 3 contains the average annual age adjusted cancer mortality rates for males. The rates of overall cancer mortality for males in both rural Appalachian and non-Appalachian populations in Kentucky have been increasing much faster than in the U.S. as illustrated in Figure 2.

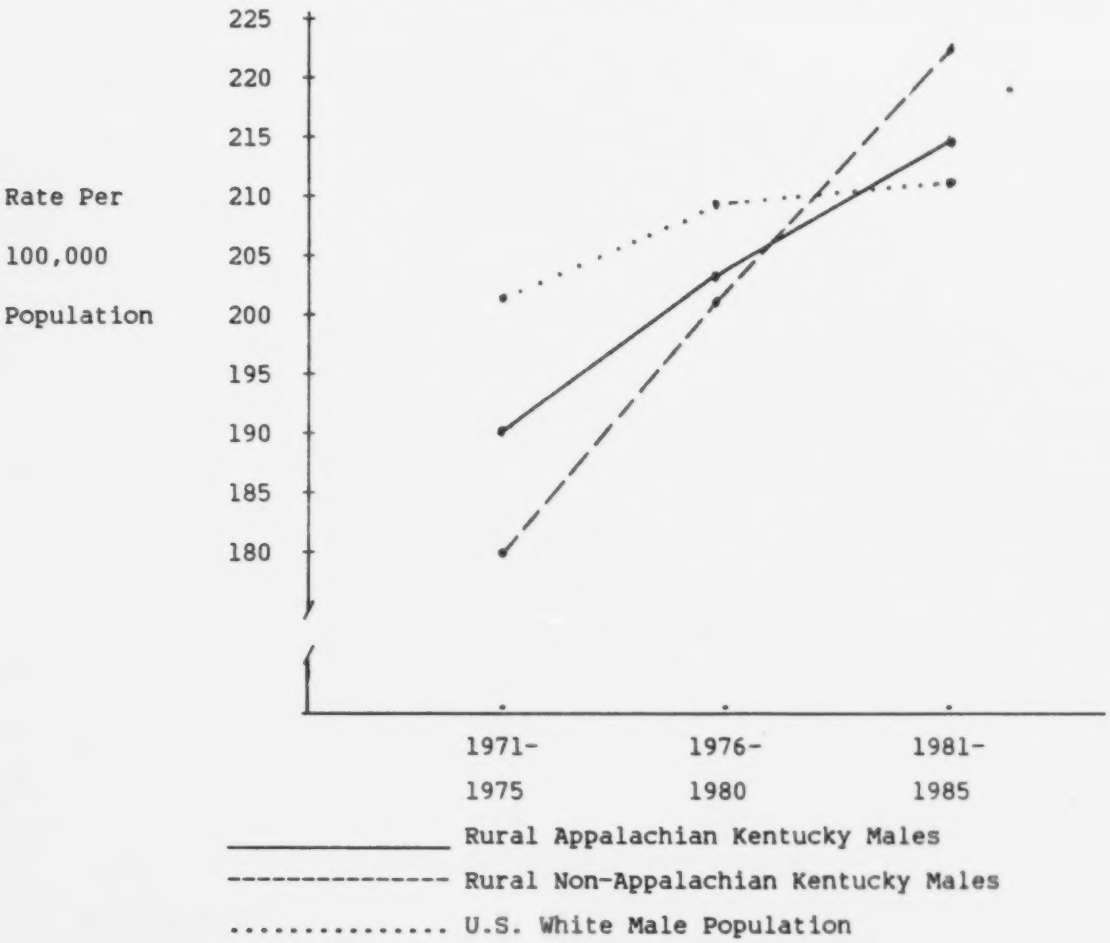
TABLE 3

Average Annual Age Adjusted Cancer Mortality Rates for Males
(Per 100,000 Population)

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky Males	189.4	202.9	213.1
Rural Non-Appalachian Kentucky Males	180.6	201.6	222.3
U.S. White Male Population	202.3	208.4	211.3

Figure 2

Changes in Average Annual Age Adjusted Cancer Mortality Rates for Males



The rates of cancer mortality among males in both rural Appalachian and non-Appalachian Kentucky have gone from significantly below the U.S. male cancer mortality rate in 1971-75 to above the U.S. rate in 1981-85. The increase in the cancer mortality rate is most dramatic among rural non-Appalachian Kentucky males.

In contrast, the average annual age adjusted cancer mortality rates for females in both rural Kentucky populations were below the U.S. cancer mortality rates for females in each time period as shown in Table 4.

TABLE 4

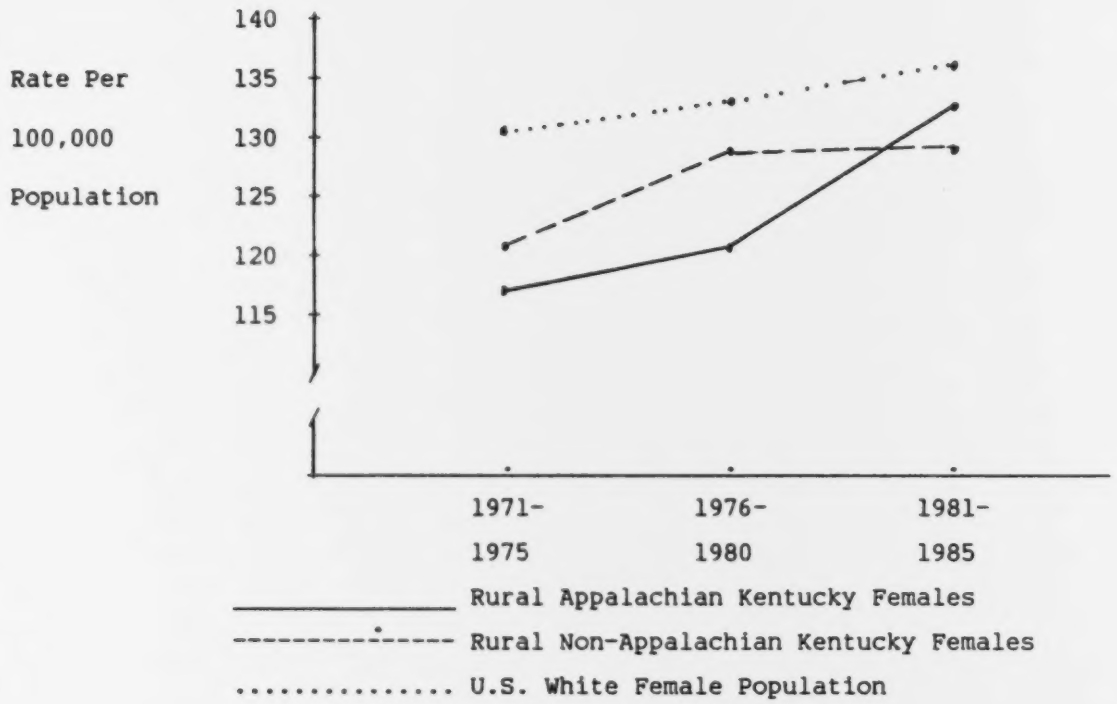
Average Annual Age Adjusted Cancer Mortality Rates for Females
(Per 100,000 Population)

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky Females	117.7	119.7	133.1
Rural Non-Appalachian Kentucky Females	120.6	128.2	129.9
U.S. White Female Population	129.8	132.1	136.2

Among females, the rural Appalachian Kentucky population showed the largest increase in cancer mortality rates between the 1976-80 and 1981-85 time periods. However, the overall average annual age adjusted cancer mortality rates for females in rural Appalachian Kentucky remained below the U.S. female cancer mortality rates as illustrated in Figure 3.

Figure 3

Changes in Average Annual Age Adjusted Cancer Mortality Rates for Females



Cancer is not one disease. Rather, there are many different types of cancer. Each type has a different biological history, is caused by different factors, is diagnosed differently and is treated with different methods. Therefore, it is useful to examine separately mortality rates from each of the major types of cancer.

B. LUNG CANCER MORTALITY RATES

The average annual age adjusted lung cancer mortality rates for each time period were higher in rural Appalachian Kentucky than either rural non-Appalachian Kentucky or the U.S. (see Table 5).

TABLE 5

Average Annual Age Adjusted Lung Cancer Mortality Rates

(Per 100,000 Population)

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky	38.0	47.6	55.9
Rural Non-Appalachian Kentucky	33.1	43.2	51.8
U.S. White Population	35.4	39.7	44.2

The age adjusted lung cancer rates for males in rural Appalachian Kentucky were substantially higher than either non-Appalachian Kentucky males or the U.S. male population as shown in Table 6. The rate of increase in lung cancer mortality among rural Appalachian males is also much greater than the U.S. male population. However, while the rural Appalachian Kentucky male population had a substantially higher lung cancer mortality rate than rural non-Appalachian Kentucky males for each time period, the rate of increase in non-Appalachian Kentucky parallels that of the rural Appalachian area (see Figure 4).

TABLE 6

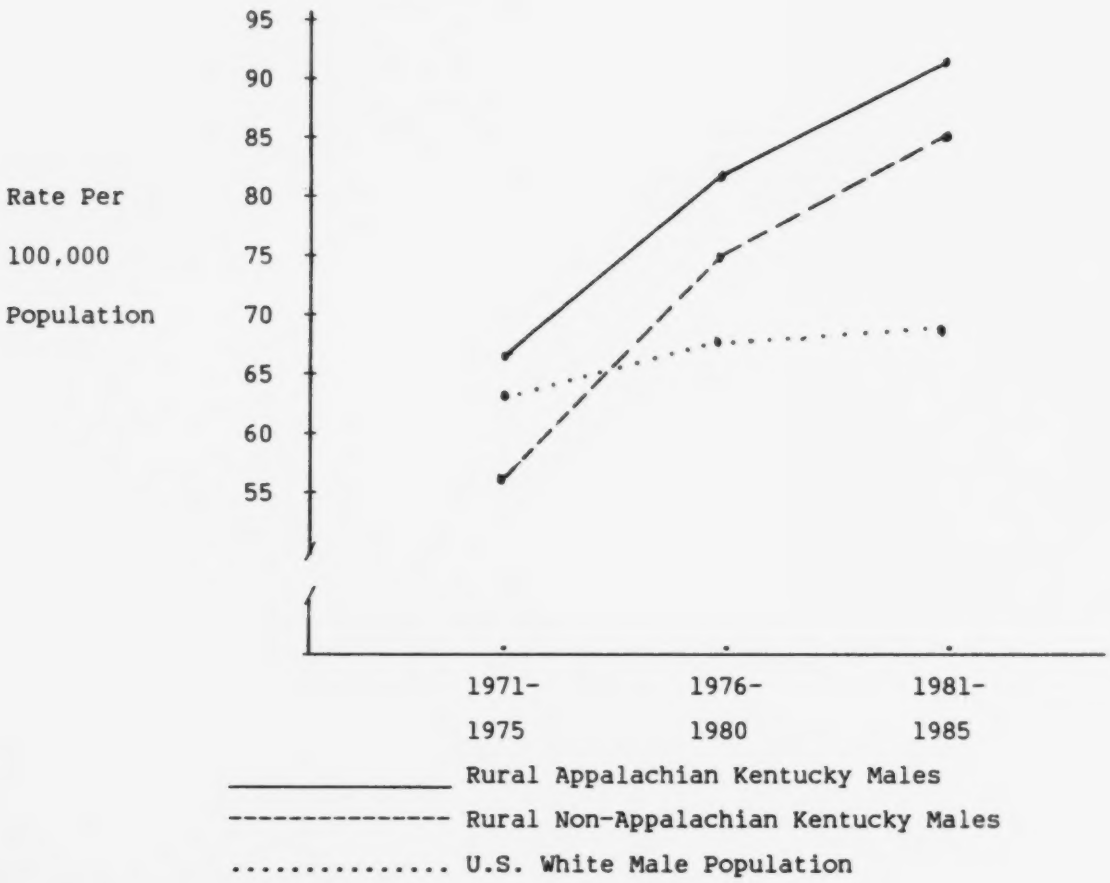
Average Annual Age Adjusted Lung Cancer Mortality Rates for Males

(Per 100,000 Population)

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky Males	66.5	82.4	91.6
Rural Non-Appalachian Kentucky Males	57.2	74.2	87.1
U.S. White Male Population	63.0	67.9	71.4

Figure 4

Changes in Average Annual Age Adjusted Lung Cancer Mortality Rates for Males



Lung cancer deaths accounted for nearly 43% of all cancer deaths among males in rural Appalachian Kentucky, 39% for males in rural non-Appalachian Kentucky and 34% for the U.S. male population. Lung cancer is the most significant cause of death from cancer for males in general. However, the impact on rural Appalachia appears to be much greater than in other areas.

The female lung cancer mortality rate has also been increasing. It is important to note, however, that the male lung cancer mortality rates are approximately 3.5 times greater than the female rates. Average annual age adjusted female lung cancer mortality rates are shown in Table 7, and changes in the rates over time are shown in Figure 5.

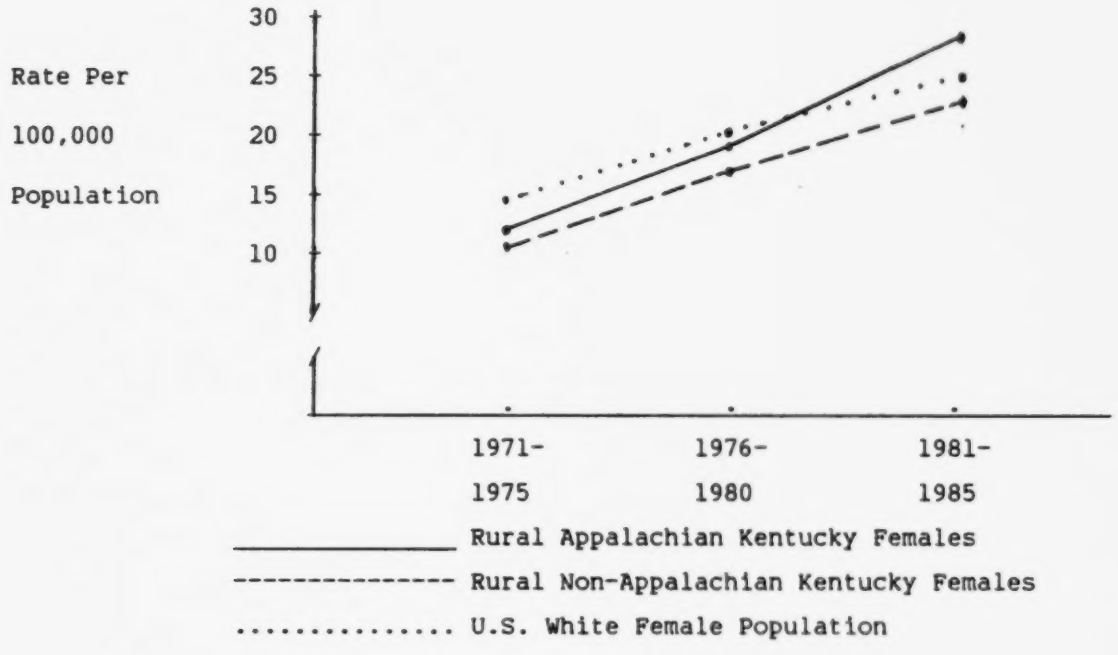
TABLE 7

Average Annual Age Adjusted Lung Cancer Mortality Rates for Females

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky Females	12.7	18.3	26.3
Rural Non-Appalachian Kentucky Females	12.1	17.1	23.0
U.S. White Female Population	14.3	18.6	24.4

Figure 5

Changes in the Average Annual Age Adjusted Female Lung Cancer Mortality Rate



The lung cancer mortality rates for women are relatively similar in each group. However, the rate of lung cancer mortality for women appears to be increasing at a faster pace in the rural Appalachian population. During the 1981-85 time period, the lung cancer mortality rate (26.3 per 100,000) exceeded that of breast cancer (22.5 per 100,00) to become the leading cause of death from cancer among rural Appalachian Kentucky women. This did not occur in the other two comparison groups.

C. COLON CANCER MORTALITY RATES

The average annual age adjusted colon cancer mortality rates were lower than those in the U.S. for the rural Appalachian population and higher than the U.S. for the rural non-Appalachian population (see Table 8).

TABLE 8

Average Annual Age Adjusted Colon Cancer Mortality Rates
(Per 100,000 Population)

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky	15.9	16.0	17.6
Rural Non-Appalachian Kentucky	19.4	21.2	21.6
U.S. White Population	17.6	18.1	17.8

When colon cancer death rates among males and females were considered separately, the general pattern of rural Appalachians having a lower colon cancer mortality rate than that of the U.S. remained true except for the 1981-85 period in which the female colon cancer mortality rate exceeded that of the U.S. female population. The rural non-Appalachian colon cancer mortality rates for each gender remained higher than that of either the rural Appalachian population or the U.S. as shown in Tables 9 and 10.

TABLE 9

Average Annual Colon Cancer Mortality Rates for Males
(Per 100,000 Population)

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky Males	17.1	16.5	19.5
Rural Non-Appalachian Kentucky Males	21.0	22.4	23.2
U.S. White Male Population	19.7	20.9	21.2

TABLE 10

Average Annual Colon Cancer Mortality Rates for Females

(Per 100,000 Population)

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky Females	15.8	15.4	16.6
Rural Non-Appalachian Kentucky Females	18.2	20.2	20.3
U.S. White Female Population	16.2	16.2	15.4

D. BREAST CANCER MORTALITY RATES

Breast cancer mortality rates were lower for women in rural Appalachia than for women in either rural non-Appalachian Kentucky or the U.S. Even though the average annual age adjusted breast cancer mortality rate increased among rural Appalachian women in the 1981-85 time period, it remained below that of either rural non-Appalachian women or the U.S. female populations (see Table 11).

TABLE 11

Average Annual Age Adjusted Female Breast Cancer Mortality Rate

(Per 100,000 Population)

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky Females	17.9	17.9	22.5
Rural Non-Appalachian Kentucky Females	21.7	23.5	23.2
U.S. White Female Population	26.8	26.7	27.1

E. CERVICAL CANCER MORTALITY RATES

The mortality rate from cervical cancer in eastern Kentucky has been reported as much higher than the cervical cancer mortality rates for either western Kentucky or the U.S.[7] Thus, in addition to the three major types of cancer, cervical cancer mortality rates were also compared.

The mortality rates from cervical cancer have been declining in each comparison group. However, the cervical cancer mortality rate for women in rural Appalachian Kentucky remained higher than that of rural non-Appalachian Kentucky women and much higher than the U.S. female population as shown in Table 12.

TABLE 12

Average Annual Age Adjusted Cervical Cancer Mortality Rates
(Per 100,00 Population)

	1971-75	1976-80	1981-85
Rural Appalachian Kentucky Females	8.5	7.8	5.5
Rural Non-Appalachian Kentucky Females	6.7	5.1	4.6
U.S. White Female Population	4.2	3.4	2.9

A major study sponsored by the Center for Disease Control (CDC), the Kentucky Department of Health Services and the Markey Cancer Center at the University of Kentucky is currently underway to determine why these differences in cervical cancer mortality exist.

III. CONCLUSIONS

Appalachian Kentucky is primarily a rural area with a rich cultural tradition. However, rural Appalachian Kentucky is different from rural non-Appalachian Kentucky in many ways. The rural Appalachian Kentucky population is poorer than the rural non-Appalachian Kentucky population. Rural Appalachian Kentucky is primarily a mining area, while rural non-Appalachia is primarily agriculture-based.

Overall cancer mortality rates in rural Appalachian Kentucky were only slightly higher than those of the U.S. population. However, the cancer mortality rates have been increasing at a much faster pace in both rural Appalachian and non-Appalachian Kentucky when compared to the U.S. population. Both the male and female cancer mortality rates in rural Appalachian Kentucky are increasing more rapidly than in the U.S. population as a whole. The cancer mortality rate among rural Appalachian females remained below the U.S. female cancer mortality rate, while both the rural Appalachian and non-Appalachian male cancer mortality rates have risen dramatically to surpass the U.S. male cancer mortality rate.

The lung cancer mortality rate has risen dramatically among rural Appalachian males and is the leading cause of death from cancer. The death rate from colon cancer is substantially lower among rural Appalachian Kentucky males as compared to rural non-Appalachian Kentucky males.

The female lung cancer mortality rate in rural Appalachian Kentucky has risen to be higher than either those of rural non-Appalachian Kentucky women or women in the U.S. population. In fact, the average annual age adjusted lung cancer mortality rate for the 1981-85 time period surpassed breast cancer to become the leading cause of death from cancer among rural Appalachian Kentucky females. Among the females, deaths from cervical cancer have declined in all three groups studied. However, the cervical cancer mortality rate for females in rural Appalachian Kentucky remains higher than either the rural non-Appalachian or the U.S. female populations. In contrast, the breast cancer mortality rates among females in rural Appalachian Kentucky were below that of females in both rural non-Appalachian Kentucky and the U.S.

The patterns of cancer mortality in rural Appalachian Kentucky appear to be different from the other areas studied in several ways. Whether these differences can be attributed to socio-economic, cultural, environmental or other differences between rural Appalachian Kentucky and other areas is yet to be determined. Variations of rates within specific geographic sub-areas of Appalachian Kentucky have also not been fully analyzed. Further study is needed to better understand why some of these differences exist and where appropriate intervention programs need to be implemented in order to reverse the pattern of rising deaths from cancer in the region. It is hoped that this report will help to stimulate that research.

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